

Theory and Evidence of the Finance-Growth Relationship: the Virtuous and Unvirtuous Cycle.

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Where Does the Capital for Eco-innovation and Resource Resilient Growth Come From?

A Balance Sheet-based Approach to Analyse Systemic Resource Risk in the New Financial System

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1. Research Topic

The near-collapse of the international financial system in 2007-2009 brought to light the fragility of the global economic system. In particular, it highlighted the level of connection of national and global economic health, the systemic nature of global risk, and the role of the perception of resource risk on prices. The resource scarcity-environment-economic growth nexus represents a form of complex adaptive system as it involves multiple sectors and agents displaying non-linear and non-rational interacting behaviours characterised by feedbacks and time lags within a finite system. The World3 System Dynamics model published in “The Limits To Growth” in 1972 (Meadows et al., 1972) represents the first attempt to show how unsustainable economic and population growth path would lead human society to reach planetary boundaries in the 21st century. Despite new calibrations showing its scenarios being meaningful also for 2012 (Pasqualino et al., 2015), the differences between the base runs and current data could be explained by the missing dimensions of the model, i.e., (i) finance, (ii) governance, and (iii) the approximate representation of pollution and technology (Monasterolo et al., 2015). In this way, it is not able to show the role of capital investments into green technology which would allow the production system to be more resource resilient.

2. Research Objective

The currently adopted economic and modelling paradigms proved not to be able to identify and address the sources of risk inside the complex financial system, their linkage with real and/or perceived resource scarcity and their cascade effects on the real economy. In fact, the neoclassical based financial models e.g., CGEM, DSGE are not able to represent such changes in the financial system and their effects on system risk (Bezemer, 2012) because they are not able, by

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construction, to model the dynamics of a complex system characterized by non-linearity, multiple feedbacks, time delays, non-linear, non-rational, short term thinking and free riders agents, thus resulting unsuitable to analyse and forecast market imbalances and the burst of financial bubbles. Yet, there is growing need to understand the new role of the finance sector and its relation to the real economy, in particular in relation to the pressing need to restore stable growth paths while preserving ecosystems. To meet the urgent challenge to build resource resilience through the development of green growth pathways, scientists and policy makers need to understand the obstacles which may prevent financial capital to flow into the economy (e.g., through investments into technology and eco-innovation to allow the transition towards green growth), thus limiting its potential leverage.

3. Research Strategy (Methodology)

In this paper we explain how a new approach based on System Dynamics (SD) (Sterman, 2000; Yamaguchi, 2013) and Agent Based Model (ABM) (Gilbert and Troitzsch 2005; Tesfatsion 2005) could help overcoming the methodological limitations of the neoclassical based macroeconomic models to shape the new reality of the financial system and its relation with (i) the resource course, (ii) eco-innovation, and (iii) the green economy. In particular, we show how such modelling approaches are able to represent the challenges for financial stability and economic growth according to the endogenous money creation theory (Werner, 2010; M. McLeay et al., 2014), while the balance sheet approach we adopt provides us with a solid, well-founded methodology to test the consistency of the macroeconomic models, and allows us to deal with the complexity of the new financial system and its role on the real economy by assuring stock and flows consistency (Cincotti et al., 2012; Raberto et al., 2011; Bezemer, 2012).

At first we develop a theoretical framework of analysis which explains the actual model of the financial system, focusing our attention on the role of financial innovation and securitization in the banking (Gorton and Metrick, 2009; Lauretta, 2014) and interbanking system (Bord and Santos, 2012; Berndt and Gupta, 2009), showing how it supports the development and spread of systemic risk, and how it eventually drops down into the real economy. Then, comparing the SD and ABM heterodox approach to the neoclassical based modelling used by financial economists, we demonstrate its potentiality to better understand the complexity, non-linearity and time dependency which characterise the relation between financial capital with natural resources and technology.

4. Conclusions

In this paper we propose a conceptual and computational tool to show the linkages between financial investments, natural resources and the real economy, highlighting the possible role and sources of financial system support to the green economy, while disclosing the potential sources of systemic risk inside the current financial system and their drop-down effects. The novelty of the paper is to describe and model how the SD and ABM approach contributes understanding how the financial sector could leverage capital for investments into resource resilient technologies, identifying obstacles, bottlenecks and enablers which arise in the interdependencies between the sectors. This point is fundamental to allow policy makers developing targeted support tools to remove barrier to flows of financial capital into the green economy.

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